Disaggregating ASCAT and ERS soil moisture products with 1 km ASAR

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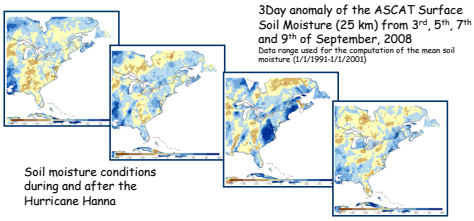
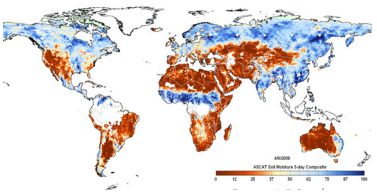
Surface Soil Moisture from METOP ASCAT (25km)

- Near real time availability via EUMETSAT (https://archive.eumetsat.int/umarf)
- Global daily coverage of 84%
- Designed for numerical weather forecasts NWF (Scipal, 2008)
- Derived using the change detection algorithm (Wagner *et al.*, 1999)

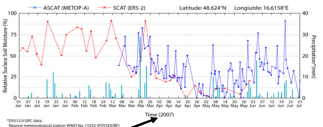


3Day anomaly of the ASCAT Surface Soil Moisture (25 km) from 3rd, 5th, 7th and 9th of September, 2008
Data range used for the computation of the mean soil moisture (1/1/1991-1/1/2001)

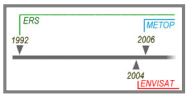
Soil moisture conditions during and after the Hurricane Hanna



ASCAT Surface Soil Moisture (25 km) from 4th of September, 2008, 3Day composite

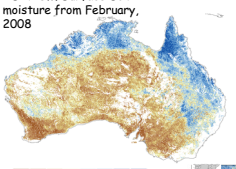


The time series demonstrate the consistency of the ERS and ASCAT soil moisture datasets (Naemi, 2008)



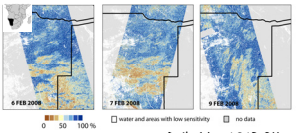
Surface Soil Moisture from ENVISAT ASAR GM (1km)

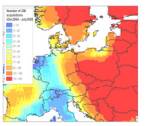
Monthly mean of 1 km ASAR GM Surface Soil moisture from February, 2008



- The processing chain setup within the ESA Tiger DUE Innovator project SHARE (Pathe, 2009).
- Derived using the change detection algorithm transferred from ASCAT to ASAR GM data

The low temporal accuracy doesn't allow for frequent monitoring (1-2) days
→
Need for downscaling techniques of ERS and ASCAT datasets

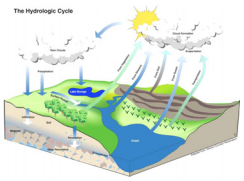




Daily 1 km ASAR GM Surface Soil moisture from 6th, 7th and 9th of February, 2008, over Namibia

ENVISAT ASAR GM Coverage over Europe

Soil Moisture: an essential climate variable



++ contributes to the predictability of precipitation

++ is important for improving numerical weather forecasts

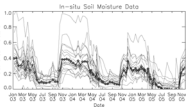
++ controls portioning of rainfall into runoff and infiltration → controls the magnitude of floods

- - available only at coarse spatial resolution (25, 50 km) →

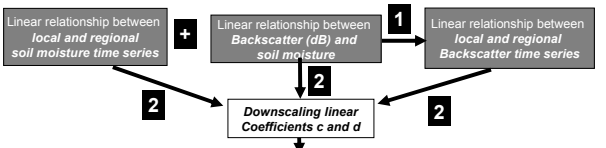
Need for higher resolution soil moisture dataset for hydrological community

Downscaling model

- Based on the temporal stability concept



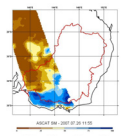
The soil moisture time series demonstrate the temporal stability concept (Wagner, 2008)



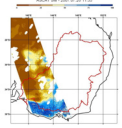
$$\theta_l(x,y,t) = c(x,y) + d(x,y)\theta_r(t)$$

Local soil moisture (θ_l) is computed as a linear combination of the regional soil moisture (θ_r)

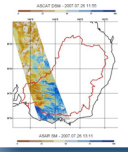
Results ASCAT Southeastern Australia



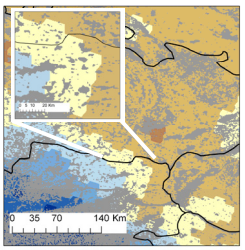
ASCAT surface soil moisture (25 km), 16th of July, 2007



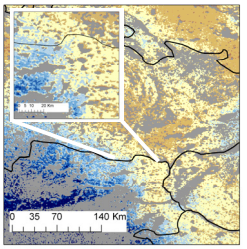
ASCAT disaggregated surface soil moisture, 26th of July, 2007



ASAR GM surface soil moisture (1km), 26th of July, 2007



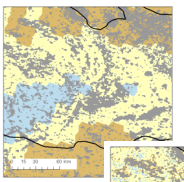
ERS surface soil moisture (50 km), 19th of April, 2005



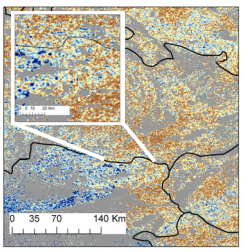
ERS disaggregated surface soil moisture, 19th of April, 2005

areas with low sensitivity

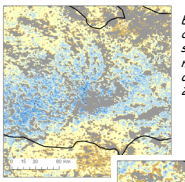
Results ERS Czech Republic & Austria



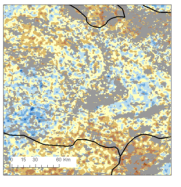
ERS surface soil moisture (50 km), 15th of November, 2005



ASAR GM surface soil moisture (1km), 19th of April, 2005



ERS disaggregated surface soil moisture, 15th of November, 2005



ASAR GM surface soil moisture (1km), 15th of November, 2005

LITERATURE

Naemi, V., Bartalis, Z., Wagner, W. (2008), ASCAT Soil Moisture: An assessment of the data quality and consistency with the ERS scatterometer heritage, American Meteorological Society (preprint), doi: 10.1175/2008JHM1051.1.

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Scipal, K., Drusch, M., Wagner, W. (2008), Assimilation of a ERS scatterometer derived soil moisture index in the ECMWF numerical weather prediction system, *Advances in Water Resource, in press.*

Wagner, W., Lemoine, G., Rott, H. (1999), A method for estimating soil moisture from ERS scatterometer and soil data, *Remote Sens. Environ.*, 70, 191– 207.

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CONCLUSION

- An innovative approach of retrieving 1 km soil moisture information from the coarse resolution products is presented.
- The results are of relevance for interpreting and downscaling coarse resolution soil moisture data retrieved from active (METOP ASCAT) and passive (SMOS, AMSR-E) instruments.